

SEQUENCE LISTING

<110> Shorrosh, Basil S.
DeBonte, Lorin R.

<120> PLANTS CONTAINING A CYTOSOLIC ACETYL
COA-CARBOXYLASE

<130> 07148-094001

<150> US 60/198,794

<151> 2000-04-20

<160> 12

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 56

<212> DNA

<213> Artificial Sequence

<220>

<223> primer for PCR

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56

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<213> Artificial Sequence

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<223> primer for PCR

<400> 2

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45

<210> 3

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<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

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48

ggt gct caa gct aac atg gtt gca cct ttc act ggc ctt aag tca gct
Val Ala Gln Ala Asn Met Val Ala Pro Phe Thr Gly Leu Lys Ser Ala
20 25 30

96

gcc tca ttc cct gtt tca agg aag caa aac ctt gac atc act tcc att 144
 Ala Ser Phe Pro Val Ser Arg Lys Gln Asn Leu Asp Ile Thr Ser Ile
 35 40 45

gcc agc aac ggc gga aga gtg caa tgc atg cag gtg tgg cca cca att 192
 Ala Ser Asn Gly Gly Arg Val Gln Cys Met Gln Val Trp Pro Pro Ile
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aac aag aag tcc 204
 Asn Lys Lys Ser
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<210> 4
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 <212> PRT
 <213> Nicotiana tabacum

<400> 4
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 20 25 30
 Ala Ser Phe Pro Val Ser Arg Lys Gln Asn Leu Asp Ile Thr Ser Ile
 35 40 45
 Ala Ser Asn Gly Gly Arg Val Gln Cys Met Gln Val Trp Pro Pro Ile
 50 55 60
 Asn Lys Lys Ser
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<210> 5
 <211> 149
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> representative construct (5' end)

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 agcaaaacct tgacatcact tccattgcca gcaacggcgg aagagtgcaa tgcattgcagg 120
 tgtggccacc aattaacaag aagtcctatg 149

<210> 6
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> representative construct (5' end)

<400> 6
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 <211> 7151

<212> DNA

<213> Medicago sativa

<220>

<221> CDS

<222> (1)...(6771)

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agt agg cac cct gct act aca acc gaa gta gat gaa tac tgc aat gcc	96
Ser Arg His Pro Ala Thr Thr Thr Glu Val Asp Glu Tyr Cys Asn Ala	
20 25 30	

ctt gga gga aac aag ccg att cat agc ata ttg att gca aac aat gga	144
Leu Gly Gly Asn Lys Pro Ile His Ser Ile Leu Ile Ala Asn Asn Gly	
35 40 45	

atg gca gca gtc aag ttt ata cgt agt gtt agg agt tgg gct tac gag	192
Met Ala Ala Val Lys Phe Ile Arg Ser Val Arg Ser Trp Ala Tyr Glu	
50 55 60	

aca ttt ggc acg gaa aaa gct atc ttg ttg gtt gcc atg gca act cca	240
Thr Phe Gly Thr Glu Lys Ala Ile Leu Leu Val Ala Met Ala Thr Pro	
65 70 75 80	

gag gat atg aga atc aat gca gaa cat atc aga ata gcc gat caa ttt	288
Glu Asp Met Arg Ile Asn Ala Glu His Ile Arg Ile Ala Asp Gln Phe	
85 90 95	

gtg gaa gta cct ggt ggg acc aat aac aat aac tac gcc aat gtg cag	336
Val Glu Val Pro Gly Gly Thr Asn Asn Asn Asn Tyr Ala Asn Val Gln	
100 105 110	

ctt att cta gag att gct gag ata act cac gtt gat gcg gtg tgg cct	384
Leu Ile Leu Glu Ile Ala Glu Ile Thr His Val Asp Ala Val Trp Pro	
115 120 125	

ggt tgg ggt cat gca tca gaa aat cct gag ctt cca gat gca tta aaa	432
Gly Trp Gly His Ala Ser Glu Asn Pro Glu Leu Pro Asp Ala Leu Lys	
130 135 140	

gca aag gga att gta ttc ctt gga cct cct gct ata tct atg gca gca	480
Ala Lys Gly Ile Val Phe Leu Gly Pro Pro Ala Ile Ser Met Ala Ala	
145 150 155 160	

ttg gga gac aaa att ggt tcc tcg ttg att gct cag gca gca gaa gtt	528
Leu Gly Asp Lys Ile Gly Ser Ser Leu Ile Ala Gln Ala Ala Glu Val	
165 170 175	

cca acc ctt cca tgg agt ggt tct cat gtg aaa att cct cca gaa agt	576
Pro Thr Leu Pro Trp Ser Gly Ser His Val Lys Ile Pro Pro Glu Ser	
180 185 190	

gac ttg att act att cct gat gaa att tac cgt gca gca tgt gtt tat	624
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cat	aat	gat	gat	gag	gtt	agg	gca	ttg	ttc	aag	caa	gtt	caa	ggg	gaa	768	
His	Asn	Asp	Asp	Glu	Val	Arg	Ala	Leu	Phe	Lys	Gln	Val	Gln	Gly	Glu		
				245					250						255		
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Val	Pro	Gly	Ser	Pro	Ile	Phe	Ile	Met	Lys	Val	Ala	Ser	Gln	Ser	Arg		
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				325					330					335			
gct	acc	gtt	gag	tat	ctt	tat	agc	atg	gaa	act	ggc	gag	tac	tac	ttt	1056	
Ala	Thr	Val	Glu	Tyr	Leu	Tyr	Ser	Met	Glu	Thr	Gly	Glu	Tyr	Tyr	Phe		
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tta	gag	ttg	aac	ccc	cga	cta	cag	gtt	gag	cat	cct	gtt	act	gaa	tgg	1104	
Leu	Glu	Leu	Asn	Pro	Arg	Leu	Gln	Val	Glu	His	Pro	Val	Thr	Glu	Trp		
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Ile	Ala	Glu	Ile	Asn	Leu	Pro	Ala	Ala	Gln	Val	Ala	Val	Gly	Met	Gly		
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atc	cca	ctc	tgg	caa	att	cct	gag	att	agg	cgt	ttc	tat	ggg	atg	gaa	1200	
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cat	ggg	ggg	gga	aat	gat	ggg	tgg	aag	aaa	aca	tca	gtg	tta	gct	acc	1248	
His	Gly	Gly	Gly	Asn	Asp	Gly	Trp	Lys	Lys	Thr	Ser	Val	Leu	Ala	Thr		
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cct	ttt	gat	ttt	gac	gaa	gca	caa	tct	aca	aag	ccg	aaa	ggg	cat	tgt	1296	
Pro	Phe	Asp	Phe	Asp	Glu	Ala	Gln	Ser	Thr	Lys	Pro	Lys	Gly	His	Cys		

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tgg gct tat ttc tct gtt aag tcc gga gga gga att cat gaa ttc tca Trp Ala Tyr Phe Ser Val Lys Ser Gly Gly Gly Ile His Glu Phe Ser 465 470 475 480			1440
gat tct caa ttt gga cat gtt ttt gcg ttt gga gaa tct aga gct tta Asp Ser Gln Phe Gly His Val Phe Ala Phe Gly Glu Ser Arg Ala Leu 485 490 495			1488
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tct ctt gtc cat tct caa gtt tct ttg agc att gaa gga agc aaa tac Ser Leu Val His Ser Gln Val Ser Leu Ser Ile Glu Gly Ser Lys Tyr 595 600 605			1824
acg att gac atg gta cga gga gga cct gga agt tac aaa ttg aaa ttg Thr Ile Asp Met Val Arg Gly Gly Pro Gly Ser Tyr Lys Leu Lys Leu 610 615 620			1872
aat caa tcg gag ata gaa gcg gag ata cac act tta cgt gat gga ggt Asn Gln Ser Glu Ile Glu Ala Glu Ile His Thr Leu Arg Asp Gly Gly 625 630 635 640			1920
ttg cta atg cag ttg gat gga aac agt cat gta ata tat gca gag gaa Leu Leu Met Gln Leu Asp Gly Asn Ser His Val Ile Tyr Ala Glu Glu 645 650 655			1968

gaa gca gct gga act cgg ctt tta ata gat gga agg act tgc ttg ctt Glu Ala Ala Gly Thr Arg Leu Leu Ile Asp Gly Arg Thr Cys Leu Leu 660 665 670	2016
cag aat gat gac gat cca tca aag tta att gga gag aca ccg tgc aag Gln Asn Asp Asp Asp Pro Ser Lys Leu Ile Gly Glu Thr Pro Cys Lys 675 680 685	2064
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cca tat gct gaa gtt gag gtc atg aag atg tgc atg cct ctt ctt tcc Pro Tyr Ala Glu Val Glu Val Met Lys Met Cys Met Pro Leu Leu Ser 705 710 715 720	2160
cct gct tct gga att att cat ttc aga atg gct gaa ggt caa gcc atg Pro Ala Ser Gly Ile Ile His Phe Arg Met Ala Glu Gly Gln Ala Met 725 730 735	2208
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gag tat ctt tca gtt gaa gaa cta ttc agt gat aat ata cag gct gat Glu Tyr Leu Ser Val Glu Glu Leu Phe Ser Asp Asn Ile Gln Ala Asp 915 920 925	2784
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gta gat att gtg ctc tct cat cag ggt gtc aag agc aaa aac aag ctg Val Asp Ile Val Leu Ser His Gln Gly Val Lys Ser Lys Asn Lys Leu 945 950 955 960	2880
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aac caa atg agt tta ctt caa gac agt ggt gat gag gat cag gct caa Asn Gln Met Ser Leu Leu Gln Asp Ser Gly Asp Glu Asp Gln Ala Gln 1185	1190	1195	3600	1200
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agg gat gaa ggg cgt gct cca atg agg cat tcc ttt cac tgg tca tct Arg Asp Glu Gly Arg Ala Pro Met Arg His Ser Phe His Trp Ser Ser 1235	1240	1245	3744	
gaa aag cta tat tat gta gag gaa cca ttg ttg ctc cat ctt gaa cct Glu Lys Leu Tyr Tyr Val Glu Glu Pro Leu Leu Leu His Leu Glu Pro 1250	1255	1260	3792	
ccc cta tcc att tat ctt gaa ctg gac aag ctt aag tgc tat gaa aat Pro Leu Ser Ile Tyr Leu Glu Leu Asp Lys Leu Lys Cys Tyr Glu Asn 1265	1270	1275	3840	1280
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Ser Ile Phe Arg Ser Leu Met Gly Ala Met Glu Glu Leu Glu Leu Asn			
1345	1350	1355	1360
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Ser His Asn Thr Thr Ile Lys Ser Glu His Ala His Met Tyr Leu Tyr			
1365	1370	1375	
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Ile Ile Arg Glu Gln Gln Ile Asp Asp Leu Val Pro Tyr Ser Lys Lys			
1380	1385	1390	
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Ile Asn Ile Glu Ala Gly Gln Glu Glu Thr Thr Val Glu Ala Ile Leu			
1395	1400	1405	
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Glu Glu Leu Ala Gln Glu Ile His Ser Ser Val Gly Val Arg Met His			
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Arg Leu Gly Val Phe Val Trp Glu Ile Lys Leu Trp Ile Thr Ala Cys			
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Gly Gln Ala Asn Gly Ala Trp Arg Val Ile Val Asn Asn Val Thr Gly			
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His Thr Cys Thr Val His Ile Tyr Arg Glu Met Glu Asp Ala Thr Thr			
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His Lys Val Val Tyr Ser Ser Val Thr Val Lys Gly Pro Leu His Gly			
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Val Pro Val Asn Glu Asn Tyr Gln Pro Leu Gly Gly Ile Asp Arg Lys			
1490	1495	1500	
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Arg Leu Ala Ala Arg Lys Asn Ser Thr Thr Tyr Cys Tyr Asp Phe Pro			
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Leu Ala Phe Gln Thr Ser Leu Glu Gln Ser Trp Ser Ile Gln Gln Thr			
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Lys Phe Ser Glu Lys Ala Gly Ser Trp Gly Thr Ser Leu Val Pro Ala			
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acc aga tgg gtt ata gat acc att gtt ggc aaa gaa gat gga ctg gga Thr Arg Trp Val Ile Asp Thr Ile Val Gly Lys Glu Asp Gly Leu Gly 1700 1705 1710	5136
gtt gaa aac ttg agt ggt agt ggg gcc att gcc ggt gcc tat tca agg Val Glu Asn Leu Ser Gly Ser Gly Ala Ile Ala Gly Ala Tyr Ser Arg 1715 1720 1725	5184
gca tac aag gaa acc ttt aca ttg aca tat gtt acc ggt agg act gtt Ala Tyr Lys Glu Thr Phe Thr Leu Thr Tyr Val Thr Gly Arg Thr Val 1730 1735 1740	5232
gga att ggt gct tat ctt gct agg ctt ggg atg agg tgc ata cag agg Gly Ile Gly Ala Tyr Leu Ala Arg Leu Gly Met Arg Cys Ile Gln Arg 1745 1750 1755 1760	5280
ctt gat caa cct ata att ctt acc ggg ttt tca gca tta aac aaa ctt Leu Asp Gln Pro Ile Ile Leu Thr Gly Phe Ser Ala Leu Asn Lys Leu 1765 1770 1775	5328
ctt ggt agg gag gtg tac agc tct cac atg caa ctt ggt gga ccg aaa Leu Gly Arg Glu Val Tyr Ser Ser His Met Gln Leu Gly Gly Pro Lys 1780 1785 1790	5376

atc atg gca aca aat gga gtc gtt cat ctc aca gtt tcg gac gac ctt Ile Met Ala Thr Asn Gly Val Val His Leu Thr Val Ser Asp Asp Leu 1795 1800 1805	5424
gaa ggc gtt tct tct att ttg aag tgg ctt agc tac gtt cct tct cat Glu Gly Val Ser Ser Ile Leu Lys Trp Leu Ser Tyr Val Pro Ser His 1810 1815 1820	5472
gta ggt ggt gca ctt ccc att gta aag ccc ctt gat ccc cca gag agg Val Gly Gly Ala Leu Pro Ile Val Lys Pro Leu Asp Pro Pro Glu Arg 1825 1830 1835 1840	5520
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tcc gga act ctg gat gtt aat gga aag tgg ctg gga ggc att ttt gac Ser Gly Thr Leu Asp Val Asn Gly Lys Trp Leu Gly Gly Ile Phe Asp 1860 1865 1870	5616
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gaa aca caa aca gtt atg caa ata ata cct gct gat cca ggt caa ctt Glu Thr Gln Thr Val Met Gln Ile Ile Pro Ala Asp Pro Gly Gln Leu 1905 1910 1915 1920	5760
gat tct cac gag agg gtt gtt cct caa gcc ggg cag gtg tgg ttt cct Asp Ser His Glu Arg Val Val Pro Gln Ala Gly Gln Val Trp Phe Pro 1925 1930 1935	5808
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Asn	Ser	Asp	His	Ile	Glu	Met	Tyr	Ala	Glu	Arg	Thr	Ala	Lys	Gly	Asn	
			2020					2025					2030			
gtc	ctt	gag	ccg	gaa	gga	atg	att	gaa	atc	aaa	ttt	aga	aca	aga	gaa	6144
Val	Leu	Glu	Pro	Glu	Gly	Met	Ile	Glu	Ile	Lys	Phe	Arg	Thr	Arg	Glu	
			2035				2040					2045				
ttg	ttg	gag	tgt	atg	aga	aga	ctt	gat	caa	caa	ttg	att	aat	ttg	aag	6192
Leu	Leu	Glu	Cys	Met	Arg	Arg	Leu	Asp	Gln	Gln	Leu	Ile	Asn	Leu	Lys	
			2050				2055				2060					
gaa	aaa	ctt	tct	gaa	gcc	aag	agt	aac	aag	gac	tat	ggt	gca	tat	gat	6240
Glu	Lys	Leu	Ser	Glu	Ala	Lys	Ser	Asn	Lys	Asp	Tyr	Gly	Ala	Tyr	Asp	
			2065			2070				2075				2080		
tct	ctg	cag	cag	cag	att	aga	ttc	cgt	gag	aaa	cag	ctt	ttg	cct	ttg	6288
Ser	Leu	Gln	Gln	Gln	Ile	Arg	Phe	Arg	Glu	Lys	Gln	Leu	Leu	Pro	Leu	
				2085				2090					2095			
tat	act	cag	ata	gct	aca	aaa	ttt	gct	gaa	ctc	cat	gat	act	tca	tta	6336
Tyr	Thr	Gln	Ile	Ala	Thr	Lys	Phe	Ala	Glu	Leu	His	Asp	Thr	Ser	Leu	
			2100					2105				2110				
aga	atg	aaa	gca	aag	ggt	gta	atc	aga	gaa	gtt	ctt	gat	tgg	cgt	aag	6384
Arg	Met	Lys	Ala	Lys	Gly	Val	Ile	Arg	Glu	Val	Leu	Asp	Trp	Arg	Lys	
			2115				2120				2125					
tcg	cgt	tct	gtc	ttc	tat	cag	aga	ctg	cac	agg	aga	atc	ggt	gag	cac	6432
Ser	Arg	Ser	Val	Phe	Tyr	Gln	Arg	Leu	His	Arg	Arg	Ile	Gly	Glu	His	
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tca	ctg	atc	aac	atc	gtg	aga	gat	gct	gct	ggt	gac	caa	ttg	tca	tat	6480
Ser	Leu	Ile	Asn	Ile	Val	Arg	Asp	Ala	Ala	Gly	Asp	Gln	Leu	Ser	Tyr	
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gtt	tct	gcc	atg	aac	ttg	ctc	aaa	gaa	tgg	tat	ctg	aat	tct	gat	atc	6528
Val	Ser	Ala	Met	Asn	Leu	Leu	Lys	Glu	Trp	Tyr	Leu	Asn	Ser	Asp	Ile	
				2165				2170			2175					
gcc	aaa	ggt	aga	gaa	gat	gct	tgg	ttg	gac	gat	gaa	gcc	ttc	ttc	aga	6576
Ala	Lys	Gly	Arg	Glu	Asp	Ala	Trp	Leu	Asp	Asp	Glu	Ala	Phe	Phe	Arg	
			2180				2185				2190					
tgg	agg	gat	gat	cca	gca	aac	tac	gag	gat	aaa	cta	aag	gaa	ttg	cgc	6624
Trp	Arg	Asp	Asp	Pro	Ala	Asn	Tyr	Glu	Asp	Lys	Leu	Lys	Glu	Leu	Arg	
			2195				2200				2205					
gtc	cag	aga	ctg	ttg	ctt	cag	ttg	aca	aat	att	ggc	gac	tcg	gct	cta	6672
Val	Gln	Arg	Leu	Leu	Leu	Gln	Leu	Thr	Asn	Ile	Gly	Asp	Ser	Ala	Leu	
			2210			2215				2220						
gat	tta	caa	gct	cta	cct	caa	ggt	ctt	gcc	gcc	ctt	tta	agc	aag	ttg	6720
Asp	Leu	Gln	Ala	Leu	Pro	Gln	Gly	Leu	Ala	Ala	Leu	Leu	Ser	Lys	Leu	
			2225		2230			2235			2240					
gaa	gca	tca	agt	cgc	gat	aag	ttg	atc	agt	gaa	ctt	cgc	aaa	gta	ctc	6768
Glu	Ala	Ser	Ser	Arg	Asp	Lys	Leu	Ile	Ser	Glu	Leu	Arg	Lys	Val	Leu	

2245

2250

2255

ggt tagtagacag tgaatgctcc tgtgatctgc ccatgcactc atgttgtagt
Gly

6821

gttcacgtcg ttgatacatg accatataga aatgtatcca ttttacgatg ttatcatcaa 6881
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<212> PRT

<213> Medicago sativa

<400> 8

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Ser	Arg	His	Pro	Ala	Thr	Thr	Thr	Glu	Val	Asp	Glu	Tyr	Cys	Asn	Ala
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Leu	Gly	Gly	Asn	Lys	Pro	Ile	His	Ser	Ile	Leu	Ile	Ala	Asn	Asn	Gly
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Met	Ala	Ala	Val	Lys	Phe	Ile	Arg	Ser	Val	Arg	Ser	Trp	Ala	Tyr	Glu
	50					55					60				
Thr	Phe	Gly	Thr	Glu	Lys	Ala	Ile	Leu	Leu	Val	Ala	Met	Ala	Thr	Pro
65					70					75				80	
Glu	Asp	Met	Arg	Ile	Asn	Ala	Glu	His	Ile	Arg	Ile	Ala	Asp	Gln	Phe
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Val	Glu	Val	Pro	Gly	Gly	Thr	Asn	Asn	Asn	Asn	Tyr	Ala	Asn	Val	Gln
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Leu	Ile	Leu	Glu	Ile	Ala	Glu	Ile	Thr	His	Val	Asp	Ala	Val	Trp	Pro
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Gly	Trp	Gly	His	Ala	Ser	Glu	Asn	Pro	Glu	Leu	Pro	Asp	Ala	Leu	Lys
			130				135					140			
Ala	Lys	Gly	Ile	Val	Phe	Leu	Gly	Pro	Pro	Ala	Ile	Ser	Met	Ala	Ala
145					150					155				160	
Leu	Gly	Asp	Lys	Ile	Gly	Ser	Ser	Leu	Ile	Ala	Gln	Ala	Ala	Glu	Val
			165					170					175		
Pro	Thr	Leu	Pro	Trp	Ser	Gly	Ser	His	Val	Lys	Ile	Pro	Pro	Glu	Ser
			180					185					190		
Asp	Leu	Ile	Thr	Ile	Pro	Asp	Glu	Ile	Tyr	Arg	Ala	Ala	Cys	Val	Tyr
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Thr	Thr	Glu	Glu	Ala	Ile	Ala	Ser	Cys	Gln	Val	Val	Gly	Tyr	Pro	Ala
	210					215						220			
Met	Ile	Lys	Ala	Ser	Trp	Gly	Gly	Gly	Gly	Lys	Gly	Ile	Arg	Lys	Val
225					230					235				240	
His	Asn	Asp	Asp	Glu	Val	Arg	Ala	Leu	Phe	Lys	Gln	Val	Gln	Gly	Glu
			245					250					255		
Val	Pro	Gly	Ser	Pro	Ile	Phe	Ile	Met	Lys	Val	Ala	Ser	Gln	Ser	Arg
			260					265					270		
His	Leu	Glu	Val	Gln	Leu	Ile	Cys	Asp	Gln	His	Gly	Asn	Phe	Ala	Ala
			275				280					285			
Leu	His	Ser	Arg	Asp	Cys	Ser	Val	Gln	Arg	Arg	His	Gln	Lys	Ile	Ile
	290						295					300			

Glu	Glu	Gly	Pro	Ile	Thr	Val	Ala	Pro	Pro	Glu	Thr	Val	Lys	Glu	Leu
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Glu	Gln	Ala	Ala	Arg	Arg	Leu	Ala	Lys	Ser	Val	Asn	Tyr	Val	Gly	Ala
				325					330					335	
Ala	Thr	Val	Glu	Tyr	Leu	Tyr	Ser	Met	Glu	Thr	Gly	Glu	Tyr	Tyr	Phe
			340					345					350		
Leu	Glu	Leu	Asn	Pro	Arg	Leu	Gln	Val	Glu	His	Pro	Val	Thr	Glu	Trp
		355					360					365			
Ile	Ala	Glu	Ile	Asn	Leu	Pro	Ala	Ala	Gln	Val	Ala	Val	Gly	Met	Gly
	370					375					380				
Ile	Pro	Leu	Trp	Gln	Ile	Pro	Glu	Ile	Arg	Arg	Phe	Tyr	Gly	Met	Glu
385					390					395					400
His	Gly	Gly	Gly	Asn	Asp	Gly	Trp	Lys	Lys	Thr	Ser	Val	Leu	Ala	Thr
				405					410					415	
Pro	Phe	Asp	Phe	Asp	Glu	Ala	Gln	Ser	Thr	Lys	Pro	Lys	Gly	His	Cys
			420					425					430		
Val	Ala	Val	Arg	Val	Thr	Ser	Glu	Asp	Pro	Asp	Asp	Gly	Phe	Thr	Pro
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Thr	Gly	Gly	Lys	Val	Gln	Glu	Leu	Ser	Phe	Lys	Ser	Lys	Pro	Asn	Val
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Trp	Ala	Tyr	Phe	Ser	Val	Lys	Ser	Gly	Gly	Gly	Ile	His	Glu	Phe	Ser
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Asp	Ser	Gln	Phe	Gly	His	Val	Phe	Ala	Phe	Gly	Glu	Ser	Arg	Ala	Leu
				485					490					495	
Ala	Ile	Ala	Asn	Met	Val	Leu	Gly	Leu	Lys	Glu	Ile	Gln	Ile	Arg	Gly
			500					505					510		
Glu	Ile	Arg	Thr	Asn	Val	Asp	Tyr	Thr	Ile	Asp	Leu	Leu	Asn	Ala	Ser
		515					520					525			
Asp	Tyr	Arg	Asp	Asn	Lys	Ile	His	Thr	Gly	Trp	Leu	Asp	Ser	Arg	Ile
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Ala	Met	Arg	Val	Arg	Ala	Glu	Arg	Pro	Pro	Trp	Tyr	Leu	Ser	Val	Val
545					550					555					560
Gly	Gly	Ala	Leu	Tyr	Lys	Ala	Ser	Ala	Ser	Ser	Ala	Ala	Leu	Val	Ser
				565					570					575	
Asp	Tyr	Val	Gly	Tyr	Leu	Glu	Lys	Gly	Gln	Ile	Pro	Pro	Lys	His	Ile
			580					585					590		
Ser	Leu	Val	His	Ser	Gln	Val	Ser	Leu	Ser	Ile	Glu	Gly	Ser	Lys	Tyr
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Thr	Ile	Asp	Met	Val	Arg	Gly	Gly	Pro	Gly	Ser	Tyr	Lys	Leu	Lys	Leu
	610					615					620				
Asn	Gln	Ser	Glu	Ile	Glu	Ala	Glu	Ile	His	Thr	Leu	Arg	Asp	Gly	Gly
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Leu	Leu	Met	Gln	Leu	Asp	Gly	Asn	Ser	His	Val	Ile	Tyr	Ala	Glu	Glu
				645					650					655	
Glu	Ala	Ala	Gly	Thr	Arg	Leu	Leu	Ile	Asp	Gly	Arg	Thr	Cys	Leu	Leu
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Gln	Asn	Asp	Asp	Asp	Pro	Ser	Lys	Leu	Ile	Gly	Glu	Thr	Pro	Cys	Lys
		675					680					685			
Leu	Leu	Arg	Tyr	Leu	Val	Ala	Asp	Asp	Ser	Gln	Ile	Asp	Ala	Asp	Thr
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Pro	Tyr	Ala	Glu	Val	Glu	Val	Met	Lys	Met	Cys	Met	Pro	Leu	Leu	Ser
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Pro	Ala	Ser	Gly	Ile	Ile	His	Phe	Arg	Met	Ala	Glu	Gly	Gln	Ala	Met
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Gln	Ala	Gly	Glu	Leu	Ile	Ala	Lys	Leu	Asp	Leu	Asp	Asp	Gly	Ser	Ala
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Val	Arg	Lys	Ala	Glu	Pro	Phe	Thr	Gly	Ser	Phe	Pro	Ile	Leu	Gly	Pro

Pro	Thr	Ala	Ile	Ser	Gly	Lys	Val	His	Gln	Lys	Cys	Ala	Ala	Ser	Leu
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Asn	Ala	Ala	Arg	Met	Ile	Leu	Ala	Gly	Tyr	Glu	His	Asn	Ile	Asp	Glu
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Val	Val	Val	Lys	Ser	Leu	Leu	Asn	Cys	Leu	Asp	Ser	Pro	Glu	Leu	Pro
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Phe	Leu	Gln	Trp	Gln	Glu	Cys	Phe	Ala	Val	Leu	Ala	Thr	Arg	Leu	Pro
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Lys	Asp	Leu	Arg	Asn	Glu	Leu	Glu	Ala	Lys	Tyr	Lys	Glu	Phe	Glu	Ile
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Ile	Ser	Ser	Ser	Gln	Thr	Ile	Asp	Phe	Pro	Ala	Lys	Leu	Leu	Lys	Ala
	850					855					860				
Ile	Leu	Glu	Ala	His	Leu	Ser	Ser	Cys	Pro	Glu	Asn	Glu	Lys	Gly	Ala
865					870					875					880
Leu	Glu	Arg	Leu	Val	Glu	Pro	Leu	Thr	Ser	Leu	Val	Lys	Ser	Tyr	Glu
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Gly	Gly	Arg	Glu	Ser	His	Ala	His	Lys	Ile	Val	Gln	Ser	Leu	Phe	Glu
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Ile	Leu	Arg	Leu	Met	Asp	Lys	Leu	Val	Tyr	Pro	Asn	Pro	Ala	Ala	Tyr
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Arg	Asp	Gln	Leu	Ile	Arg	Phe	Ser	Gln	Leu	Asn	His	Ile	Val	Tyr	Ser
			980					985					990		
Glu	Leu	Ala	Leu	Lys	Ala	Ser	Gln	Leu	Leu	Glu	Gln	Thr	Lys	Leu	Ser
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Thr	Leu	Val	Glu	Lys	His	Ser	Glu	Lys	Lys	Trp	Gly	Val	Met	Val	Val
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Glu	Arg	Ile	Asp	Lys	Leu	Ala	Lys	Ile	Leu	Arg	Glu	Gln	Glu	Ile	Gly
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Ser Ile Ile His Ala Ala Gly Val Gly Asp Ile Ser Cys Ile Ile Gln
 1220 1225 1230
 Arg Asp Glu Gly Arg Ala Pro Met Arg His Ser Phe His Trp Ser Ser
 1235 1240 1245
 Glu Lys Leu Tyr Tyr Val Glu Glu Pro Leu Leu Leu His Leu Glu Pro
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 Pro Leu Ser Ile Tyr Leu Glu Leu Asp Lys Leu Lys Cys Tyr Glu Asn
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 Ile Arg Tyr Thr Pro Ser Arg Asp Arg Gln Trp His Leu Tyr Thr Val
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 Ile Ile Arg Glu Gln Gln Ile Asp Asp Leu Val Pro Tyr Ser Lys Lys
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 His Lys Val Val Tyr Ser Ser Val Thr Val Lys Gly Pro Leu His Gly
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 Glu Val Lys Ala Cys Phe Lys Val Gly Trp Ser Glu Glu Ser Lys Pro
 1650 1655 1660
 Glu His Gly Phe Gln Tyr Val Tyr Leu Thr Pro Glu Asp Tyr Ala Arg

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	1700	1705	1710
Val Glu Asn Leu Ser Gly Ser Gly Ala Ile Ala Gly Ala Tyr Ser Arg			
	1715	1720	1725
Ala Tyr Lys Glu Thr Phe Thr Leu Thr Tyr Val Thr Gly Arg Thr Val			
	1730	1735	1740
Gly Ile Gly Ala Tyr Leu Ala Arg Leu Gly Met Arg Cys Ile Gln Arg			
1745	1750	1755	1760
Leu Asp Gln Pro Ile Ile Leu Thr Gly Phe Ser Ala Leu Asn Lys Leu			
	1765	1770	1775
Leu Gly Arg Glu Val Tyr Ser Ser His Met Gln Leu Gly Gly Pro Lys			
	1780	1785	1790
Ile Met Ala Thr Asn Gly Val Val His Leu Thr Val Ser Asp Asp Leu			
	1795	1800	1805
Glu Gly Val Ser Ser Ile Leu Lys Trp Leu Ser Tyr Val Pro Ser His			
	1810	1815	1820
Val Gly Gly Ala Leu Pro Ile Val Lys Pro Leu Asp Pro Pro Glu Arg			
1825	1830	1835	1840
Glu Val Glu Tyr Leu Pro Glu Asn Ser Cys Asp Pro Arg Ala Ala Ile			
	1845	1850	1855
Ser Gly Thr Leu Asp Val Asn Gly Lys Trp Leu Gly Gly Ile Phe Asp			
	1860	1865	1870
Lys Asp Ser Phe Val Glu Thr Leu Glu Gly Trp Ala Arg Thr Val Val			
	1875	1880	1885
Thr Gly Arg Ala Lys Leu Gly Gly Ile Pro Val Gly Ile Val Ala Val			
	1890	1895	1900
Glu Thr Gln Thr Val Met Gln Ile Ile Pro Ala Asp Pro Gly Gln Leu			
1905	1910	1915	1920
Asp Ser His Glu Arg Val Val Pro Gln Ala Gly Gln Val Trp Phe Pro			
	1925	1930	1935
Asp Ser Ala Thr Lys Thr Ala Gln Ala Ile Leu Asp Phe Asn Arg Glu			
	1940	1945	1950
Glu Leu Pro Leu Phe Ile Ile Ala Asn Trp Arg Gly Phe Ser Gly Gly			
	1955	1960	1965
Gln Arg Asp Leu Phe Glu Gly Ile Leu Gln Ala Gly Ser Thr Ile Val			
	1970	1975	1980
Glu Asn Leu Arg Thr Tyr Lys Gln Pro Ile Phe Val Tyr Ile Pro Met			
1985	1990	1995	2000
Met Gly Glu Leu Arg Gly Gly Ala Trp Val Val Val Asp Ser Arg Ile			
	2005	2010	2015
Asn Ser Asp His Ile Glu Met Tyr Ala Glu Arg Thr Ala Lys Gly Asn			
	2020	2025	2030
Val Leu Glu Pro Glu Gly Met Ile Glu Ile Lys Phe Arg Thr Arg Glu			
	2035	2040	2045
Leu Leu Glu Cys Met Arg Arg Leu Asp Gln Gln Leu Ile Asn Leu Lys			
	2050	2055	2060
Glu Lys Leu Ser Glu Ala Lys Ser Asn Lys Asp Tyr Gly Ala Tyr Asp			
2065	2070	2075	2080
Ser Leu Gln Gln Gln Ile Arg Phe Arg Glu Lys Gln Leu Leu Pro Leu			
	2085	2090	2095
Tyr Thr Gln Ile Ala Thr Lys Phe Ala Glu Leu His Asp Thr Ser Leu			
	2100	2105	2110
Arg Met Lys Ala Lys Gly Val Ile Arg Glu Val Leu Asp Trp Arg Lys			
	2115	2120	2125

Ser Arg Ser Val Phe Tyr Gln Arg Leu His Arg Arg Ile Gly Glu His
 2130 2135 2140
 Ser Leu Ile Asn Ile Val Arg Asp Ala Ala Gly Asp Gln Leu Ser Tyr
 2145 2150 2155 2160
 Val Ser Ala Met Asn Leu Leu Lys Glu Trp Tyr Leu Asn Ser Asp Ile
 2165 2170 2175
 Ala Lys Gly Arg Glu Asp Ala Trp Leu Asp Asp Glu Ala Phe Phe Arg
 2180 2185 2190
 Trp Arg Asp Asp Pro Ala Asn Tyr Glu Asp Lys Leu Lys Glu Leu Arg
 2195 2200 2205
 Val Gln Arg Leu Leu Leu Gln Leu Thr Asn Ile Gly Asp Ser Ala Leu
 2210 2215 2220
 Asp Leu Gln Ala Leu Pro Gln Gly Leu Ala Ala Leu Leu Ser Lys Leu
 2225 2230 2235 2240
 Glu Ala Ser Ser Arg Asp Lys Leu Ile Ser Glu Leu Arg Lys Val Leu
 2245 2250 2255
 Gly

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 <213> Artificial Sequence

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 <223> primer for PCR

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20

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23

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46

<210> 12
 <211> 46
 <212> DNA
 <213> Artificial Sequence

<220>

<223> representative construct (3' end)

<400> 12

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46